

(Forthcoming in Sam Trangredi Ed., *Globalization and Maritime Power*, NDU, 2002)

## **Market Effects of Naval Presence in a Globalized World**

by

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### **Introduction**

Over the years, one of the more illusive questions posed to and by the Navy concerns the economic benefits to the United States and allied countries provided by U.S. Naval forward presence. While most authorities on the subject contend that these benefits are significant, their measurement has always been fraught with conceptual and computational difficulties. The greatest difficulty has always involved developing a convincing counterfactual—what would the state of affairs been in the absence of forward deployed naval forces?

### **Background**

The issue came to the fore in preparing for the Congressionally-mandated 1997 Quadrennial Defense Review. Early on in the QDR, Navy leaders asked if the economic benefits of forward engaged naval forces could be quantified and thereby communicated to policy makers. Until this point, the only evidence of such benefits was anecdotal (Cf. System Planning Corporation, 1996). At that time the Naval Postgraduate School was tasked by N8C-N81-N3/N5 to develop new methodologies directed toward the quantification of these benefits.

The methodology ultimately developed focused on the affect of Naval Forward Engagement and Crisis Response on world oil prices, as reflected by oil futures markets (summarized in Looney, Schrady and Brown, 2001). Using a vector autoregression econometric model (Sims, 1980), the approach then linked the oil price affects associated with Naval forward engagement and crisis response to changes in major economic indicators.

This methodology was then applied to three cases of Naval Forward Engagement and Crisis Response: the opening stages of Desert Shield (1990 Gulf War); the Iraq-Kuwait border incident of October 1994; and the January 1987 Gulf Shipping Crisis. These crises varied in terms of the military threat posed to U.S. and allied interests, oil market conditions, business cycles and the general world economic climate, but a clear trend emerged from the analysis of each incident. When oil futures markets become aware of Naval forward engagement/crisis response, oil prices decline.

By stabilizing and lowering prices in oil futures markets during these crises, Naval Forward Presence provided significant benefits to the U.S. economy. These benefits are measured in terms of dollar losses that would have occurred in the absence of Naval

crisis response. Conservative estimates indicate that Naval Crisis Response in the opening stages of Desert Storm provided \$55.22 billion (1997 dollars) worth of economic benefits (Gross Domestic Product, GDP) to the United States. Similarly, Naval Forward Engagement during the 1994 Iraq-Kuwait border incident yielded \$7.13 billion (1997 dollars) in benefits, while Naval Forward Engagement during the 1987 Gulf Shipping Crisis produced \$5.01 billion (1997 dollars) in benefits. Naval Forward Engagement and Crisis Response not only had a positive impact on the U.S. economy, but also on the economy of America's allies. Naval Crisis Response in the opening states of Desert Storm alone is likely to have provided up to a \$86.80 billion (1997 dollars) increase in world income (GDP).

In summary, several major findings emerged from this research:

- Most important, it is possible to develop procedures to quantitatively measure some of the economic impacts of Naval Forward presence.
- Economic Impacts can be measured in terms of dollar cost savings and or additional dollar resources available to the economy.
- These economic impacts can be significant. They may also persist over a fairly long time period and across the economies of a large number of US allies.
- While these initial estimates of the economic benefits associated with Naval Forward Presence are high, it is apparent that they underestimate the complete benefits associated with crisis response—one can simply not put a hard figure on the benefits from the many crisis no doubt prevented by the mere forward presence of the Navy.

The study concluded that economic benefits associated with Naval forward engagement in the Gulf region would most likely outweigh the costs associated with these operations. Albeit without hard analysis, it was concluded that in the future, given the nature of oil markets, Naval forward engagement probably would continue to yield significant economic gains.

A follow-up study undertaken in FY2000 for N81 extended our methodology through: (1) the use of a highly objective statistical analysis (cointegration, error-correction) capable of quantifying the short and long run impacts of naval movements on oil prices (Pesaran and Pesaran, 1997) and (2) the development of our new cases of Naval forward presence/crisis response. Cases were selected to provide our sample with greater geographical diversity and market impact. In addition, care was taken to assure that these cases involved primarily naval units, with at best limited participation from the other services. The study produced a number of significant findings. As in the first study, all cases were shown to produce positive economic benefits for the United States economy. These benefits, measured in 1995 US dollars were non-trivial with each operation yielding well over a billion dollars in terms of added GDP to the US economy.

While oil markets were the one constant throughout the cases, several other markets were affected by naval actions. These include: the dollar/yen exchange rate, the CRB commodity index, the Goldman-Sachs Commodity Index, the S&P-100, the NIKKEI 100, the Hang-Seng, and the New York Stock Exchange Composite Index. More importantly naval events had a positive effect at all times. In each case involving oil or commodity markets, naval events reduced the price from what it would have been in the absence of forward presence/crisis response. In the case of share markets and the dollar/yen exchange rate, prices were higher than they would have been in naval forces had not been present.

In effecting these markets, naval events were shown to produce a short-run (overnight effect) in the directions noted above. More importantly the analysis found that naval events impact on these markets lingers for a significant time period, altering prices for a period of time that allows for significant benefits to the United States economy.

## **Overview**

The generalizations noted above can be the basis of assessing future economic impacts associated with naval forward presence/crisis response. In this regard the sections below address the following issues: Can we predict in advance the general magnitude of economic benefits accruing from similar operations? What methods are best to do this? What factors need to be taken into account? How might these change with the evolution of Globalization and increased economic integration? Will these changes in the international economic environment likely strengthen or weaken the positive economic impacts associated with Naval forward presence/crisis response?

To address these issues the current the sections that follow develop an integrated framework for assessing the consequences of globalization on the market forces associated with naval forward presence/crisis response. Here we have drawn heavily on the rapidly expanding literature on globalization, integrating it with our quantitative findings on economic benefits. In particular we have focused on the key linkages between naval forward presence, oil prices, and globalization. Has globalization over time strengthened or weakened this link? What elements of globalization have been most important in this regard? Are these trends likely to continue into the foreseeable future?

Here the linkages between naval forward presence/crisis response and oil prices are examined in the context of changes in the global economy and the various dimensions of globalization. An operational procedure is developed to measure the various facets of globalization and track their movements over time. Next the magnitude of oil price shocks' effect on domestic economies is shown to depend critically on the global environment in which they occur. Several groups of countries are identified by the manner in which oil shocks reduce their national incomes. The first group of advanced countries including the United States has, because of trends in globalization, become more vulnerable over time to oil price shocks. That is with time, oil shocks of a given magnitude have tended to produce greater and greater reductions in Gross Domestic Product (GDP). The second group of countries, largely the top layer of developing countries led by Mexico, South Africa and Korea is also

affected by globalization, but to a lesser extent. That is while these countries GDP is still reduced by oil price shocks, globalization appears to have been less of a factor.

In short the main finding of the research summarized below is that of naval forward presence playing an increasingly important role in stabilizing the economies of the advanced industrial nations. Other parts of the world benefit also, although trends in globalization suggest the economic gains that accrue from naval forward presence are of a lower magnitude.

## **Globalization and Naval Forward Presence**

The current debates over the relative merits of globalization provide some insight into the manner in which market price modifications brought about by naval forward presence impact on the economies in different parts of the world. In a recent article Nobel Prize winner Amartya Sen (2001) of Cambridge University provides some basic answers to several of the key elements of this debate that have relevance to the changing economic impact of naval forward presence.:

1. Globalization is not new, nor is it just Westernization: Over thousands of years, globalization has progressed through travel, trade, migration, spread of cultural influences and dissemination of knowledge and understanding (including science and technology).
2. Globalization is not in itself a folly: It has enriched the world scientifically and culturally and benefited many people economically as well. In this regard modern technologies as well as economic interrelations have been influential.
3. The use of the market economy can produce different outcomes. Specifically, The market economy can generate many different results, depending on how physical resources are distributed, how human resources are developed, what rules prevail and so on in all these spheres and the state and the society have roles, within a country and in the world.
4. The world has changed since the Bretton Woods Agreement: The current economic, financial, and political architecture of the world (including the World Bank, the International Monetary Fund and other institutions) was largely set up in the 1940s, following the Bretton Woods Conference in 1944. The implication being that the current system does not have institutions that are responsive to many of the changed economic circumstances and as such many parts of the world are not well served by the current system.

Sen is suggesting that various parts of the world have evolved somewhat differently over the last several decades and, as a result, possess economic environments that respond quite differently to various types of external shocks. The main problem for assessing the economic consequences of naval forward presence is, therefore, one of deriving an operational classification of these the environments.

## **Country Classification Scheme**

In this regard, Jeffrey Sachs (2000) provides a good starting point for grouping countries in terms of their interaction with the global economy. Although Sach's paper was written to provide a framework for examining the consequences of globalization for the growth potential of various parts of the world it develops an initial country classification scheme in which seems appropriate for the assessment of the manner in which global forward presence market links such as oil market price movements produce a differential impact on domestic economies. As a first approximation to the world's different economic environments, Sachs develops five main groupings (Table 1):

### ***Endogenous Growth Countries.***

These countries are experiencing the process of self sustaining increases in income generated mainly by technological innovation. Innovation raises national income, which in turn stimulates further innovation in a positive feedback process (Lucas, 1988; Romer 1986, 1990).

For this group of countries globalization should be a major spur to innovation by increasing the extent of the market. It may also concentrate innovative activity if it creates a more integrated global labor market for scientists and engineers who are then likely to aggregate in the highly innovative core economies. Most proxies of innovative activity (patents, R&D expenditures, and numbers of scientific publications) suggest a huge spurt in such activities in the 1990s. The rapid growth of labor productivity in the United States since the early 1990s also supports the notion of a surge in innovation in line with the increasing globalization of the world economy.

On the other hand it is not obvious that globalization is reducing or increasing this group's vulnerability to oil price shocks (need references about new economy and the reduced vulnerability to external shocks). The standard answer is that information based economies use less oil per unit of Gross Domestic Product (GDP) and therefore are becoming less dependent on imported energy. For example in the case of the United States (Stelzer, 2000) during the 1970s oil products accounted for almost 9% of Gross Domestic Product. Today the figure is about 3%. More efficient car engines are one explanation. Another is the steady shift of the American economy to knowledge driven activities.

Presumably also the endogenous growth countries' flexibility and abilities to shift to alternative sources of energy in the short run aid in minimizing the economic impact produced by oil price shocks. However a good case could be made that increased globalization has created a greatly expanded set of macroeconomic linkages between these and many non-endogenous group countries who may be becoming more vulnerable to oil price shocks as they speed up industrialization. An oil shock induced recession in these countries could feed back to the endogenous countries, seriously affecting their economies through declining export sales. Ultimately then the net impact of oil price movements on the endogenous countries can only be assessed through empirical testing.

**Table 1**  
**Initial Categorization of Countries**  
**According to Globalization and Growth Mechanism**

Endogenous Growth	Catching up	Primary Producer	Malthusian	Isolated Economies
Australia	Bangladesh	Algeria	Afghanistan	Armenia
Austria	Bulgaria	Angola	Benin	Azerbaijan
Belgium	China	Bolivia	Botswana	Belarus
Canada	Domin Rep.	Cameroon	Burkina Faso	Kazakhstan
Denmark	Hungary	Chile	Cambodia	Kyrgyzstan
Finland	Indonesia	Congo	Central African Republic	Moldova
France	Jamaica	Costa Rica	Chad	Turkmenistan
Germany	Malaysia	Cote d'Ivoire	Congo, DR	Uzbekistan
Hong Kong	Mauritius	Ecuador	Eritrea	
Ireland	Mexico	Gambia	Ethiopia	
Israel	Mongolia	Ghana	Gabon	
Italy	Nicaragua	Guinea Bissau	Guatemala	
Japan	Oman	Honduras	Haiti	
Korea	Philippines	Kenya	Iraq	
Netherlands	Poland	Kuwait	Jordan	
New Zealand	Portugal	Mauritania	Laos	
Norway	Romania	Mozambique	Lesotho	
Singapore	Spain	Nigeria	Liberia	
Sweden	Sri Lanka	Papua New Guinea	Mali	
Switzerland	Thailand	Saudi Arabia	Namibia	
Taiwan	Tunisia	Sierra Leone	Nepal	
UK	Turkey	Syria	Niger	
United States	Vietnam	Tanzania	Pakistan	
		Togo	Paraguay	
		Trinidad	Rwanda	
		Uganda	Somalia	
		UAE	Sudan	
		Venezuela	Tajikistan	
		Yemen	Zambia	
		Zimbabwe		

Source: Jeffrey D. Sachs, "Globalization and Patterns of Economic Development" Weltwirtschaftliches Archiv, vol 136, no 4 (2000), p. 583.

### ***Catching-up-growth Countries***

This group of countries is the process whereby an economy with a lower level of technology and income (the “follower”) narrows the income gap with the higher technology and richer countries (the “leader”) through a process of technological diffusion and capital flows from leader to follower.

While all countries enjoy some benefit of technological growth in the leading country, the rate at which technology diffuses from leader to follower differs sharply around the world. A region that is geographically isolated, for example is much less likely to benefit from technological diffusion.

Two kinds of countries appear to be winners the race in absorbing technologies from abroad. Countries with successful export-promotion policies, such as Korea and Taiwan, have earned the foreign exchange necessary to import technologies from abroad. Also countries that have been able to attract large flows of foreign direct investment have similarly been able to upgrade technologies with particular success.

There is little doubt that successful catching up growth involves a positive feedback process between technological diffusion and human capital accumulation. Initially, human capital is low in the laggard economy and technologies are rudimentary. The country may achieve some modest inflow of technology by attracting labor intensive export oriented foreign direct investment for example, labor intensive assembly operations in export processing zones. These simple assembly operations generate income, some modest skills, and the resources to invest in improved education. The combination of rising skill levels and rising educational attainment leads to an upgrading of the foreign investment facilities.

As with the endogenous countries, it is impossible to say a priori much about the manner in which increased globalization is affecting the net effects on these countries produced by an oil shock. On the one hand increased globalization has accelerated the long term growth path of these countries (Table 2) suggesting that they may be operating at close to full potential and thus more vulnerable to oil price increases. On the other hand with increased diversification these economies may be able to shift to alternative sources of energy, thus avoiding the full brunt of the external shocks. Finally as in the case of the endogenous growth countries oil price shocks may impact indirectly through slowing down the growth of major external markets. Again the matter must ultimately be resolved through empirical testing and simulation.

**Table 2**

**Characteristics of Countries According to Growth/Globalization Categories**

Country Types	Number of Countries	Population (total for group millions)	GNP per capita (US\$ basis)	Annual growth of GNP per capita 1990-99	% of Population in temperate ecozones	% Pop within 100 km of the sea
Endogenous growth countries	23	844	20,400	2.1	76	69
Catching-up growth countries	23	2,063	5,599	2.7	28	59
Primary commodity producers	32	465	3,694	0.0	9	44
Malthusian countries	31	466	1,782	-0.3	4	19
Isolated economies	8	74	2,372	na	14	0

Source: Jeffrey D. Sachs, "Globalization and Patterns of Economic Development" *Weltwirtschaftliches Archiv*, vol 136, no 4 (2000), p. 584.

***Resource-based growth***

This is the process whereby an economy experiences cycles of per capita income mainly as the result of resource booms and busts. In fact it has often been noted in recent years that natural resource rich economies have fared particularly badly (Table 2), especially in comparison to many of the resource-scarce economies. Even oil booms may have an adverse effect on oil producing countries (Looney, 1990) through the Dutch Disease mechanisms—overvalued exchange rate, increased domestic inflation and a shift to non-trade activities. However given the Dutch Disease effect is a longer term phenomenon it is probably safe to conclude that at least in the case of oil producers increased globalization the short run effect of an oil price increase would be positive. Given their rigidity and lack of diversification, non-oil producing countries would most likely have declines on their incomes during periods of oil price shocks, especially with globalization increasing their dependence on foreign markets.



### ***Malthusian decline***

Malthusian decline is a process of falling per capita income caused by population pressures outstripping the carrying capacity of the local economy, in circumstances in which the country is neither innovating nor successfully adopting technologies from abroad. These countries seem to be experiencing a long-term decline in living standards that transcends the effects of terms-of-trade shocks of cyclical phenomena. Sub-Saharan Africa is the most disturbing case of an impoverished region suffering outright declines in living standards. Somewhat less dramatically, the Andean region seems also to be stuck with stagnant or even falling living standards. Given economic structure of this group of countries, it is probably safe to assume that any trends in globalization would increase their vulnerability to oil price shocks.

### ***Economic isolation***

Economic isolation is a phenomenon of economic stagnation that results from an economy's physical or policy induced isolation from world markets. The main problem with the landlocked countries is that international trade is sharply hindered by the geographical isolation of these countries. In terms of increased globalization, foreign investors in particular do not view these impoverished nations as effective platforms for export-oriented foreign direct investment. Thus these countries are typically unable to attract the kind of assembly operations in garments, electronics, footwear, and other sectors which have been important stepping stones to economic development in more favorably located economies. Foreign investors come, if at all, only to exploit primary commodities with a high value per unit weight—such as oil and gas, diamonds and other metals—since such commodities can be profitably exploited even when transport costs are high. Without the diversification and flexibility needed to modify oil price shocks, one must conclude that these countries, unless hydrocarbon producers themselves, are very vulnerable to developments in the international oil market.

### ***Summary***

The previous sections have outlined a very general starting point for examining how trends in trends in globalization may affect the economic benefits derived from naval forward presence. Clearly the great diversity of economic environments makes generalization in this area very hazardous. On the other hand, several distinctive national economic environments can be identified. As a very first approximation it is reasonable to expect that most or all countries in a particular group would be affected in a roughly similar manner by external oil shocks.

Building on this framework, the next section provides an operational method for quantifying these country groupings and, when necessary, reclassifying countries to better reflect a common underlying set of global economic forces. More importantly the analysis will assess the manner in which globalization has altered the structure of these countries over time with regard to making them more or less vulnerable to oil price shocks i.e., with trends in globalization, which countries are benefiting more from naval forward presence and to what extent? Which are less affected from the Navy's presence, and by how much?

## **Quantification of Globalization**

One of the main hindrances to a meaningful assessment of the manner in which increased globalization affects the economic benefits associated with naval forward presence is that the term globalization remains vague, meaning different things to different people and groups. While there seems to be a consensus that globalization—whether economic, political, cultural or environmental—is defined by increasing levels of interdependence over vast distances. A study by A.T. Kearny (2001) notes however, few people have undertaken the task of actually trying to measure those levels of interdependency. “For instance, how do we determine the extent to which a country has become embedded within the global economy? How do we demonstrate that globalization is racing ahead, rather than just limping along? Clearly the lack of a clear, precise definition underlies much of the current arguments and debates overmuch the extent of globalization and the manner that phenomenon is changing the structure of national economies. As the Kearney study notes: “Without the means to quantify the extent of globalization, any meaningful evolution of its effects will remain elusive” (A.T. Kearny 2001, p. 56).

### ***Previous Attempts at Quantification***

The Kearney approach is to reverse-engineer globalization and breaks it down into its most component parts. On a country-by country basis Kearney quantifies the levels of personal contact across national borders by combining data on international travel, international phone calls, and cross-border remittances and other transfers. The Kearney index charts the World Wide Web by assessing not only its growing numbers of users but also the number of internet hosts and secure servers through which they communicate, find information and conduct business transactions.

The Kearney globalization index also measures economic integration, it tracks the movements of goods and services by examining the changing share of international trade in each country's economy, and it measures the permeability of national borders through the convergence of domestic and international prices. The index also tracks the movements of money by tabulating inward-and outward direct foreign investment and portfolio capital flows, as well as income payments and receipts..

As the Kearney study notes, much of the conventional wisdom cherished by both champions and critics of globalization collapses under the weight of hard data, ranging from the pace and scale of global integration and the characteristics of the digital divide to the impact of globalization on income inequality, democratization and corruption. Rosenau (1996) has also outlined the many of the benefits in and conceptual problems of devising a meaningful operational definition of globalization.

While the Kearney index is a step in the right direction, it still suffers from many of the problems associated with index construction. Here the problems are fundamentally: (1) what measures do you want to include in the index; (2) are these measures comparable across countries. Specifically, is there a universal standard on what each measure comprises and is the data of equal quality across countries, and (3) what system of weights will be used to combine the various measures into a final summary index. Clearly each possible (arbitrary) weighting system will provide a somewhat different picture as to the extent of globalization in any particular country.

The Kearney study does not treat these issues, but they need to be addressed before the index can provide any new meaningful insights to the globalization process. Lockwood (2001) outlines a number of other problems associated with Kearney index.

### ***A New Approach to Quantification***

One away to get around this problem is to compile an extensive data set of the most widely used economic statistics and measures of world trade, capital flows, economic integration and the like. Clearly, many of these measures will overlap and thus be redundant. Using factor analysis however the main dimensions of global diversity can be identified.

More specifically the basic assumption of factor analysis is that a limited number or underlying dimensions (factors) can be used to explain complex phenomena. The resulting data reduction produces a limited number of independent (uncorrelated) composite measures. In the current example, measures such as value added per unit of capital, value added per laborer, value added per firm and so on could provide a composite index of productivity or relative efficiency in factor usage. One advantage of indexes formed in this manner is that it avoids the problem of selecting one measure of efficiency say value added per worker over just as logical alternatives.

Formally as an initial step in exploratory data analysis factor analysis has three objectives: to study the correlations of a large number of variables by clustering the variables into factors such that variables within each factor are highly correlated; to interpret each factor according to the variables belonging to it; and to summarize many variables by a few factors.

The usual factor analysis model expresses each variable as a function of the factors common to several variables and a factor unique to the variable:

$$z_j = a_{j1}F_1 + a_{j2}F_2 + \dots + a_{jm}F_m + U_j$$

Where

$z_j$  = the  $j$ th standardized variable

$m$  = the number of factors common to all the variables

$U_j$  = the factor unique to variable  $z_j$

$a_{ji}$  = factor loadings

The number of factors,  $m$ , should be small and the contribution of the unique factors should also be small. The individual factor loadings,  $a_{ji}$ , for each variable should be either very large or very small so each variable is associated with a minimal number of factors.

To the extent that this factor analysis model is appropriate for the problem at hand, the objectives noted above can be achieved. Variables with high loadings on a factor tend to be highly correlated with each other, and variables that do not have the

same loading patterns tend to be less highly correlated. Each factor is interpreted according to the magnitudes of the loadings associated with it.

Perhaps more importantly for the problem at hand, the original variables can be replaced by the factors with little loss of information. Each case (firm) receives a score for each factor; these factor scores can be computed as:

$$F_i = b_{i1}z_1 + b_{i2}z_2 + \dots b_{ip}z_p$$

where  $b_{ij}$  are the factor score coefficients. Factor scores are in turn used in the discriminant analysis that follows. In general these factor scores have less error and are therefore more reliable measures, than the original variables. The scores express the degree to which each case possesses the quality or property that the factor describes. The factor scores have a mean of zero and standard deviation of one.

Operationally, the computations of factors and factor scores for each country were obtained through a principle components procedure. The data used in the analysis was taken from the annual World Bank World Development Indicators (2001) and include:

- Domestic absorption (% of GDP)
- Domestic credit provided by banking sector (% of GDP)
- Expenditure, total (% of GDP)
- Trade (% of GDP)
- Trade (% of goods GDP)
- Imports of goods and services (% of GDP)
- Financing from abroad (% of GDP)
- Foreign direct investment, net inflows (% of GDP)
- Exports of goods and services (% of GDP)
- Domestic financing, total (% of GDP)
- Gross private capital flows (% of GDP, PPP)
- Telephone mainlines (per 1,000 people)
- Gross foreign direct investment (% of GDP, PPP)
- GDP growth (annual %)
- Import Growth (annual %)
- Exports of goods and services (annual % growth)
- Sub-Saharan Dummy
- Small Country Dummy
- Oil dummy
- Revised Country Classification

### ***Quantified Dimensions of Globalization***

While the exact composition of factors varied slightly from year to year over the analysis period (1985-97) the set of 20 variables generally produced five main trends or dimensions (factors):

1. Structural Openness, depicting the share of national economic integration into the world economy. Operationally this comprises the share of imports and exports as a % of Gross Domestic product (GDP). The variables comprising this factor do not change much over time and the dimension is usually the first factor to be extracted from the data set.
2. General Globalization, for lack of a better term. This dimension incorporates those the variables that load on Sachs' country grouping dimension (Table ). Sachs' list of countries was also expanded to include several additional countries such as Brazil. The number of variables loading on this grouping dimension increase considerably over time, with the factor incorporating an increasingly diverse set of global indices. From this we can conclude that process of globalization affects each of the different country groupings in unique ways and that globalization is an on-going process in this regard.
3. Finance, comprising both domestic and foreign components such as foreign direct investment, financing from abroad and the like
4. Growth/Trade Expansion, comprising both external and internal measures of economic expansion. The main variables comprising this factor are import and export growth and overall GDP growth. Usually (but not always) GDP growth is highly correlated with the measures of trade expansion.
5. Global Structure, comprising several structural variables to take into account several unique country characteristics identified in the literature. The literature (Bloom and Sachs, 1998). suggests that the Sub-African countries may have a unique set of factors that sets them apart from other developing countries. To take this potential factor into account a variable (SUBAF) was created with 0s for the non-African countries and 1 for the African nations.

Another body of literature contends (Looney, 1991) that small countries due to a much narrower resource base and smaller domestic market are at a disadvantage vis a vie their larger counterparts. To take this effect into account another variable was created with a value of 1 assigned to the smaller nations (usually those with a population less than 5 million) and a zero for the larger countries.

Finally, another body of literature (Robert Looney, 1992) stresses the unique structure of the oil economies. This factor is taken into account with a final variable oil which assigns a value of one to the oil economies and a zero to non-oil nations

### ***Revised Factor Scores and Country Groupings***

Because Sach's classification was intended to examine the growth potential of a large group of countries, there is a good chance his country groupings do not correspond precisely with an ideal grouping intended to define unique economic environments for our purposes, i.e. the identification of differential impacts stemming from oil price shocks. Also, Sach's definition appears to be static. There is little evidence of movement between groups or a precise indication of under what circumstances movement might take place. In the case of economic environments,

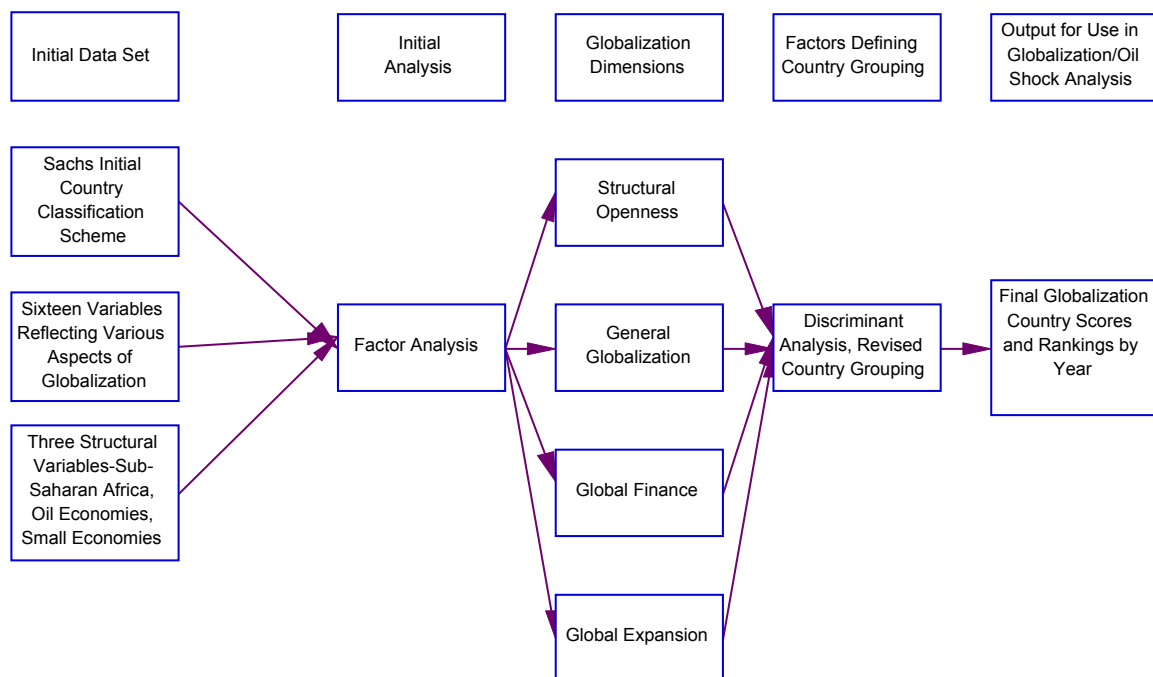
we would expect more shifting between groups as countries evolve and economic policies are altered.

To overcome these limitations we proceeded (Figure 1) with the following procedure:

First, for each individual year examined, a factor analysis was undertaken using the 20 variables noted above. In the case of 1995 54 countries had complete data observations for this period and were retained in the analysis. The 20 variable data set was comprised of five main dimension or factors (based on the constraint of an eigen value of one or greater).

Figure 1

### Globalization and Country Economic Environments



Sachs country classification term was included in the second factor along with gross private capital flows, export share in GDP, gross foreign direct investment etc. That is these variables varied significantly by country grouping. The country factor scores on each dimension are based on a scale with a mean of zero. Positive numbers indicate above normal attainment of a particular factor or global dimension, while negative values indicate that the country/group is below average in attainment of that dimension. For example in 1995 the trade patterns of the United States account for a considerably smaller share of GDP than the sample norm. The US is even well below the norm of the Endogenous Growth countries (Group 1). The United States is considerably above the sample average for its attainment of General Globalization (Dimension 2), but again considerably below the norm for Endogenous growth countries. The US is slightly above the norm for global financial flows, and even above the norm for Endogenous growth countries. Finally the US had above average growth during this period, again somewhat above that of the Group 1 countries. In general the global structure dimension is an amalgamation of variables that do not load on one of the main globalization dimensions, so its significance is hard to interpret. It is included here to simply show the complete results of the analysis.

Second, using the country factor scores from this step a discriminant analysis was undertaken to assign a new set of country groupings. Which of the five main dimensions of globalization noted above were critical in assigning countries to one of the five groups? For example, in 1995 two dimensions, (a) General Globalization, and (b) Trade Expansion were statistically significant in separating the sample countries into five main groupings. Of the original country classifications 71.7 percent remained in their initial groups, with the remainder assigned to new groups. For example Korea had only a 8.3 percent chance of being a Group 1 (Endogenous Growth) country, but a 90.3 percent chance of correctly falling into Group 2 (Catching Up).

The third step entailed redefining the country classification variable from the results of the second step above. Here, the factor analysis was rerun to generate a new set of factor scores, more reflective of the each country's position in the total sample and in its assigned group.

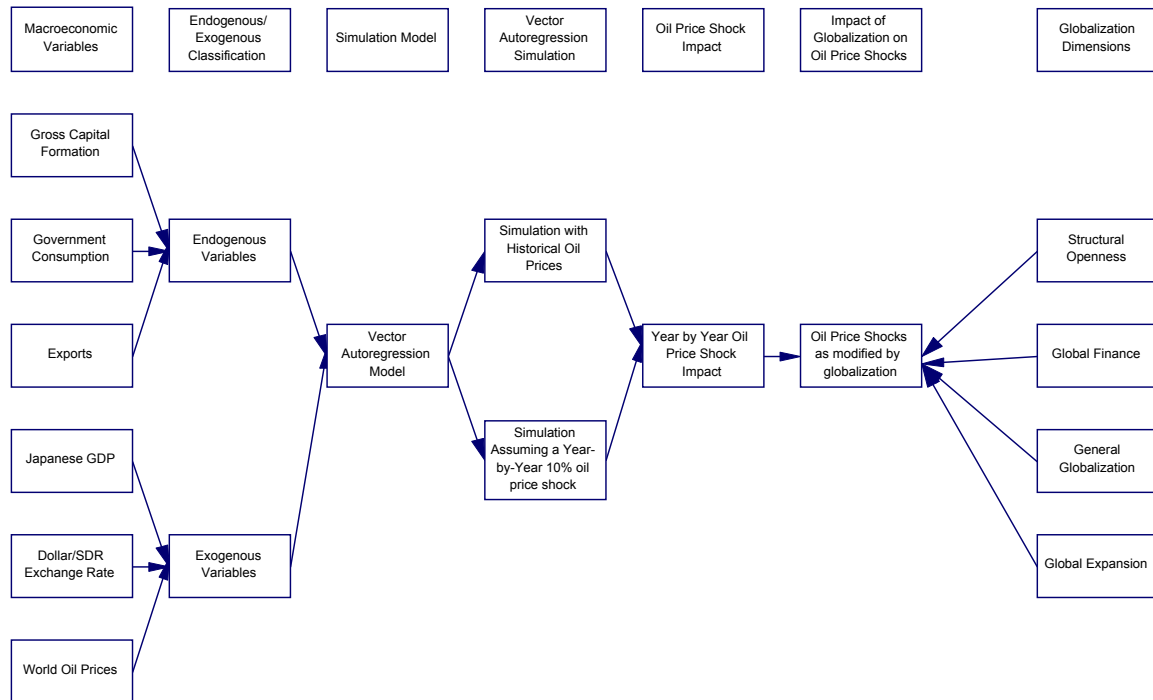
Finally, using these scores a new discriminate analysis found that General Globalization (Factor 2) and Global Expansion (Factor 3) were statistically significant in assigning countries to the five group model. On this basis the probably of correct placement in one of the five groups was 92.6 percent, with all of the group 1 countries correctly placed. This last step provides the country groupings and factor scores used in the oil price impact analysis. As noted above, the analysis was undertaken for 1977, 1980, 1983 and each year for the period 1985-1997.

### ***Globalization and the Strength of Oil Shocks***

The revised factor scores or globalization dimensions for each country are a key element in assessing the manner in which oil price shocks have been modified over time by changes in the world economy. Using the United States as an example, the link between oil price shocks and globalization is outlined in Figure 2.

Figure 2

## United States: Globalization Impact on Oil Price Shocks



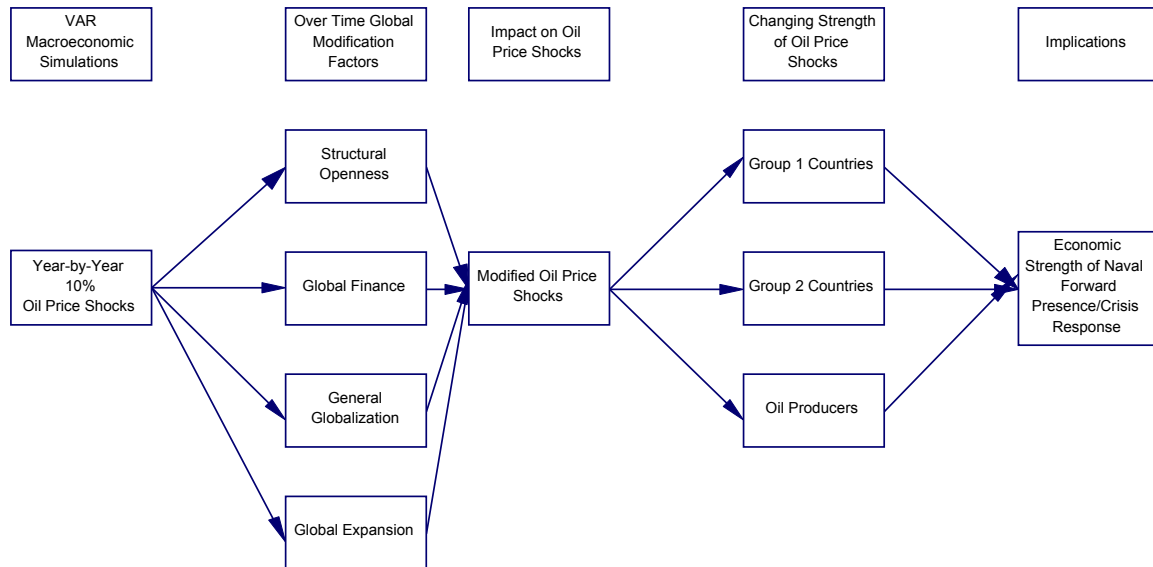
As a starting point a macroeconomic model was constructed for each of the nineteen countries examined. In the case of the United States economy, the model consisted of three endogenous macroeconomic variables, gross capital formation, government consumption and exports (all at constant dollar prices), and three exogenous variables: Japanese constant price GDP, the dollar/SDR exchange rate and world oil prices. A first set of simulations for each year (1985-97) were made using the historical values for oil prices. A second set of simulations were made assuming a 10 percent increase in the price of oil for each base year. The net impact on GDP was then calculated by subtracting the simulations incorporating oil price shocks from the historical series. Oil shock impacts were calculated for the shock year and two subsequent years. Finally the resulting oil shocks were regressed on the various globalization dimensions to assess the role that changes in global dimensions for each country might have had in modifying the manner in which oil prices altered that country's Gross Domestic Product (GDP).

Based on these findings, implications were drawn (Figure 3) for the likely future role of naval forward presence/crisis response. For example if the size of oil price shocks increase over time for a particular country, then naval forward presence by suppressing oil price increases would play an increasingly important role in stabilizing that country's GDP. On the other hand if the dimensions of globalization lessened the loss in GDP associated with oil price shocks then naval forward presence would decline in importance in providing economic benefits to that country.



Figure 3

## Implications of Globalization For Naval Forward Presence



## Economic Impact of Naval Forward Presence

Using the framework developed above the changing strength of oil price shocks a sample of 19 countries was undertaken. Based on this analysis a number of generalizations are drawn concerning the likely future economic role played by naval forward presence.

### United States

#### *Patterns of Globalization*

The US is far and away the world's leading economic power. Its GDP totaled US\$9.3 trillion in 1999; assuming international purchasing power parity, this was 3 times the size of Japan's output, 4.8 times the size of Germany's and almost 7 times the size of the UK's. Although the volume of its exports and imports exceeds that of any other country, the value of the US's external sector as a percentage of its GDP is comparatively low. Exports of goods and services accounted for less than 11 % of GDP in 1999, considerably less than the EU's 25-29 in recent years.

As noted earlier, our approach focuses largely on the period 1985-1997, the period when many observers feel the process of globalization began to significantly

affect the world's leading economies. The rationale here is to provide a framework for examining a large sample of countries so that their various unique patterns of globalization could be identified and examined as possible contributing factors to the differing manner in which oil price shocks affect national economies. In turn, this would then contribute to our identification of the countries most likely to benefit from naval forward presence/crisis response.

With these goals in mind, the factor/discriminant analysis of United States globalization found some significant differences between the US economy and the norm for Group 1 countries. Table 3 reports the factor scores on the globalization dimensions for the United States, Group 1 and Group 2 countries. Factor scores are in effect an index formed from the weighted average of the most important elements entering into a dimension. They have a mean of zero, with positive numbers indicating an above average attainment of the country/group on that dimension. Negative scores are indicative of below average attainment of that dimension. On this basis: (1) the US structural openness dimension scores considerably below the group average, suggesting that trade plays less of a role in American economy than for other advanced industrial nations; (2) the general globalization dimension is also somewhat below the group norm, while (3) financial globalization and growth in the world market are above the pattern typically found in other advanced countries.

Recent patterns of US globalization have been (as in the other Group 1 countries) characterized by a rapid increase in the general globalization dimension (Figure 4). Contrary to popular belief the US has not dramatically increased its relative position to other countries with regard to the other dimensions of globalization: global openness, financial flows or expansion in the global economy. This finding is consistent with that of Dunn (2001). While Dunn's main conclusion is that the U.S. economy is far from being completely globalized, our findings suggest that at least with regard to the general globalization dimension, significant movement has been made in that direction.

### ***Globalization and Oil Price Shocks***

United States—a group 1 country has as we will see the normal pattern of a positive sign (Table 4) associated with increased levels of general globalization i.e. over time and everything else equal oil price shocks have been stronger because of globalization. Perhaps as a result of the general globalization dimension, there has been a significant increase in the amount of GDP loss associated with oil price shocks (Figures 5, 6).

### ***Implications for Naval Forward Presence***

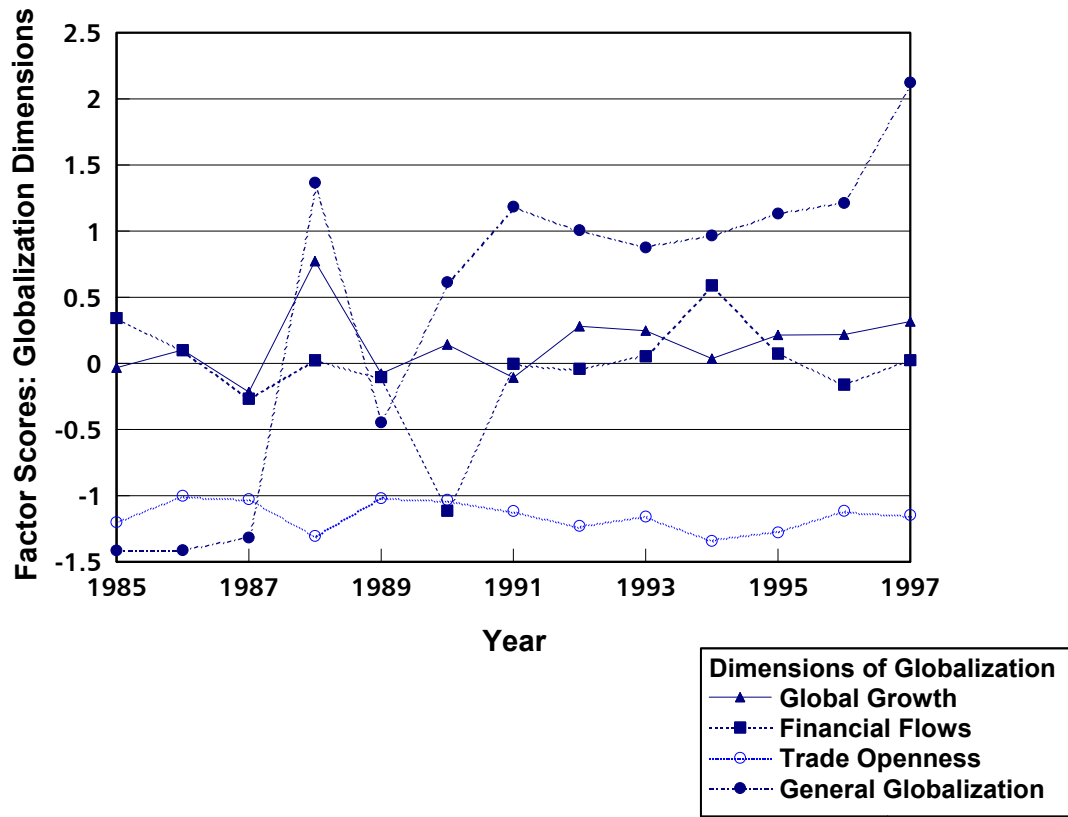
The recent increase in severity of income loss associated increased general globalization combined with oil price increases together with no offsetting effects produced by the other dimensions of globalization suggest that in the future naval forward presence should increase its contribution to the economy through the dampening of oil price increases..

**Table 3**  
**Dimensions of Globalization: Factor Scores, 1988-1996**

Year		Structural Openness	General Globalization	Financial Globalization	Global Growth
1988	US	-1.305	1.367	0.023	0.773
	Group 1	-0.190	1.166	-0.081	0.116
	Group 2	0.112	-0.290	-0.080	0.690
1989	US	-1.109	1.238	-0.104	-0.078
	Group 1	0.004	1.669	-0.119	-0.103
	Group 2	-0.056	-0.292	-0.102	0.148
1990	US	-1.031	0.615	-1.114	0.143
	Group 1	-0.024	1.387	-0.722	-0.109
	Group 2	-0.027	-0.481	-0.600	0.037
1991	US	-1.116	1.185	-0.003	-0.108
	Group 1	-0.066	1.423	-0.200	-0.208
	Group 2	0.069	0.161	0.116	0.132
1992	US	-1.229	1.007	-0.041	0.280
	Group 1	-0.142	1.504	-0.067	-0.269
	Group 2	0.257	0.043	-0.182	0.306
1993	US	-1.159	0.876	0.054	0.247
	Group 1	-0.180	1.399	0.407	-0.182
	Group 2	0.381	0.102	-0.285	0.074
1994	US	-1.342	0.968	0.590	0.036
	Group 1	-0.156	1.541	0.244	-0.223
	Group 2	0.325	0.110	-0.071	0.146
1995	US	-1.278	1.134	0.074	0.214
	Group 1	-0.294	1.618	-0.023	-0.208
	Group 2	0.096	-0.117	-0.294	0.706
1996	US	-1.115	1.213	-0.160	0.217
	Group 1	-0.326	1.724	-0.239	-0.106
	Group 2	0.159	-0.034	-0.341	0.140
1997	US	-1.146	2.124	0.024	0.316
	Group 1	-0.694	2.538	0.079	-0.159
	Group 2	0.461	0.028	-0.558	0.100
Average	US	-1.183	1.173	-0.066	0.204
	Group 1	-0.207	1.597	-0.072	-0.145
	Group 2	0.178	-0.077	-0.240	0.248

Figure 4

## Patterns of Globalization: US



**Table 4**

**Summary Oil Shock Impact Analysis: United States**

Period of Impact	Globalization Dimensions			
	General Globalization	Structural Openness	Financial Globalization	Global Growth
<u>Cumulative</u>				
Impact Year	+	ins	ins	ins
Impact Year + 1	+	ins	ins	ins
Impact Year +2	+	ins	ins	ins
<u>Cumulative % GDP</u>				
Impact Year	+	ins	ins	ins
Impact Year + 1	+	ins	ins	ins
Impact Year +2	+	ins	ins	ins
<u>Yearly</u>				
Impact Year	+	ins	ins	ins
Impact Year + 1	+	ins	ins	ins
Impact Year +2	+	ins	ins	ins

Notes: Group 1 Country. US data used in the analysis. + indicates a factor increasing the strength of oil price increases in affecting Gross Domestic Product (GDP); ins = statistically insignificant at the 95% level - indicates a factor weakening the strength of oil price increases in affecting Gross Domestic Product (GDP).

Figure 5

## Yearly Oil Shock Impact: US

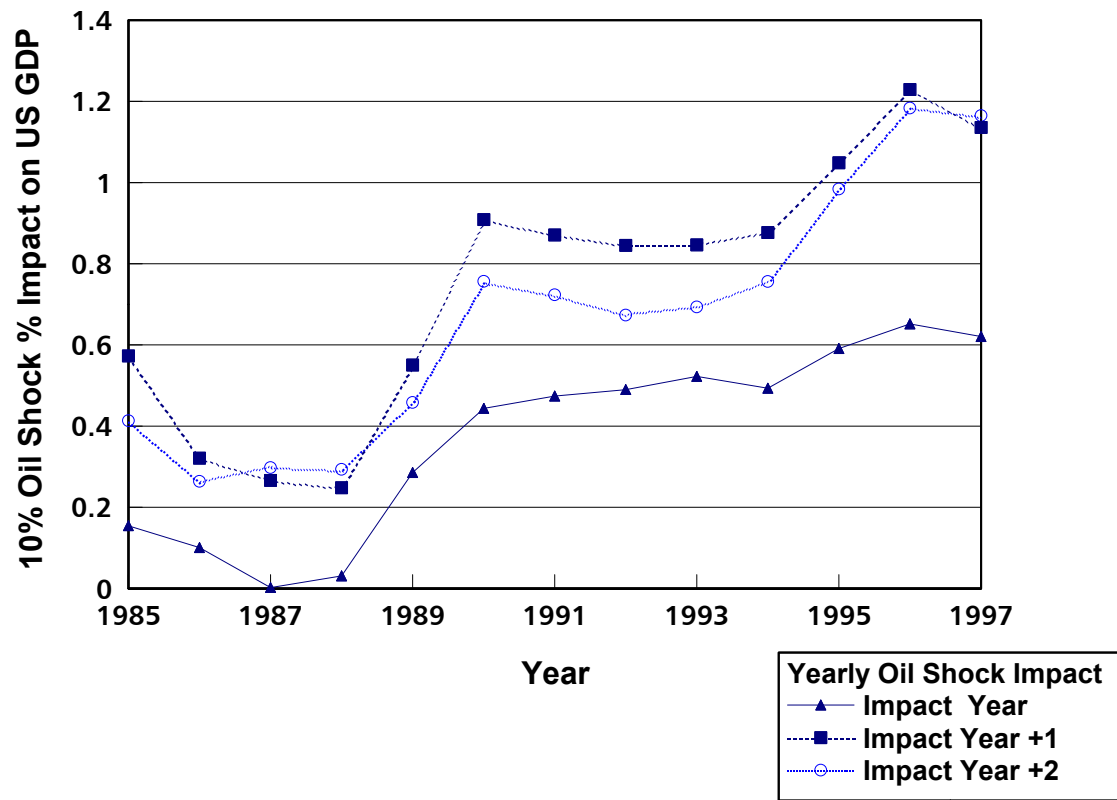
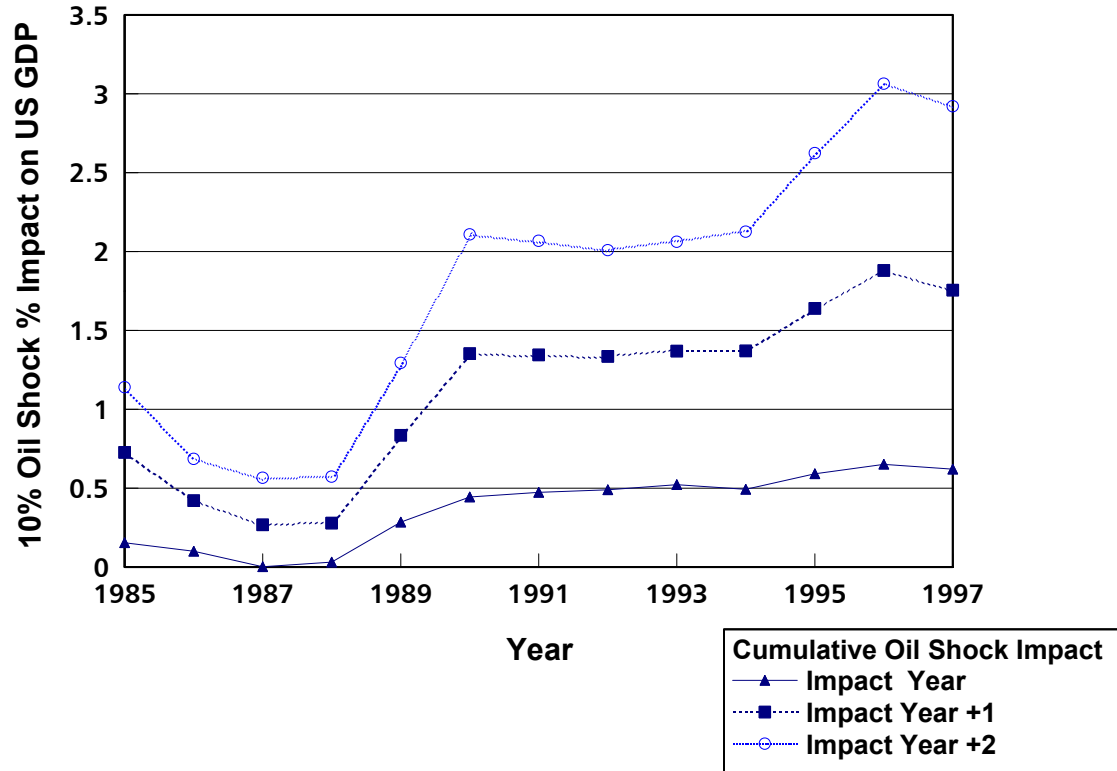


Figure 6

## Cumulative Oil Shock Impact: United States



## Other Countries

A similar analysis was undertaken for eighteen additional countries whose selection was largely dictated by the available data. Here, the analysis found clear linkage between the globalization defined country groups and the manner in which oil shocks affect their economies (Table 5). Over time and contrary to popular opinion Group 1 countries have become more vulnerable to oil price shocks in the sense that a 10 percent increase in the price of oil today would cause a greater reductions in income i.e., the oil shock driven loss in income as a percent of GDP has increased gradually over time in line with the process of globalization. For these countries, general globalization and structural openness have been most responsible for the increased severity of oil shocks. Changes in financial globalization and the global growth dimension of globalization have not only played a much smaller role in this regard, but have made some countries less vulnerable and others more vulnerable—no clear patterns emerge from these aspects of globalization. Because Naval forward presence/crisis response tends to suppress oil shocks and return prices to their equilibrium levels, the role of naval activities of this regard has not only taken on increased importance in recent years but with the likely continuation of global trends should play an even greater positive economic role for the United States and other industrial countries in the foreseeable future.

The two Group 1 exceptions are Spain and Japan, where financial flows have lessened somewhat the severity of oil price shocks. Nonetheless oil price shocks still inflict considerable economic losses on these countries assuring an important role for naval crisis response.

As might be imagined the two oil economies included in the study, Mexico and Norway would experience declines in income associated with forward deployed naval operations. On the other hand movements in globalization have resulted in Norway obtaining smaller and smaller economic gains from oil price shocks, whereas Mexico's have gains have stabilized. In both instances the losses associated with naval forward presence are lower than might have been the case if the trends in globalization had been similar to those in the Group 1 countries as a whole.

A very different globalization/oil shock pattern characterizes the Group 2 (catch up countries). Over time increases in the general globalization dimension has lessened the impact of oil price shocks on these countries. On the other hand, the financial dimension has worked to increase the severity of oil shocks on most of these countries. The net effect is that the Philippines, Portugal and South Africa have with time experienced a gradual increase in the severity of oil price shocks. In Korea's case the forces of globalization have appeared to neutralize each other. The net effect has been a rather constant loss in income associated with oil price shocks. Given these patterns, naval forward presence/crisis response should continue to play an important role (but less critical role than in the case of the Group 1 countries) in stabilizing this Group's economies.



**Table 5**  
**Summary Oil Shock Impact Analysis**

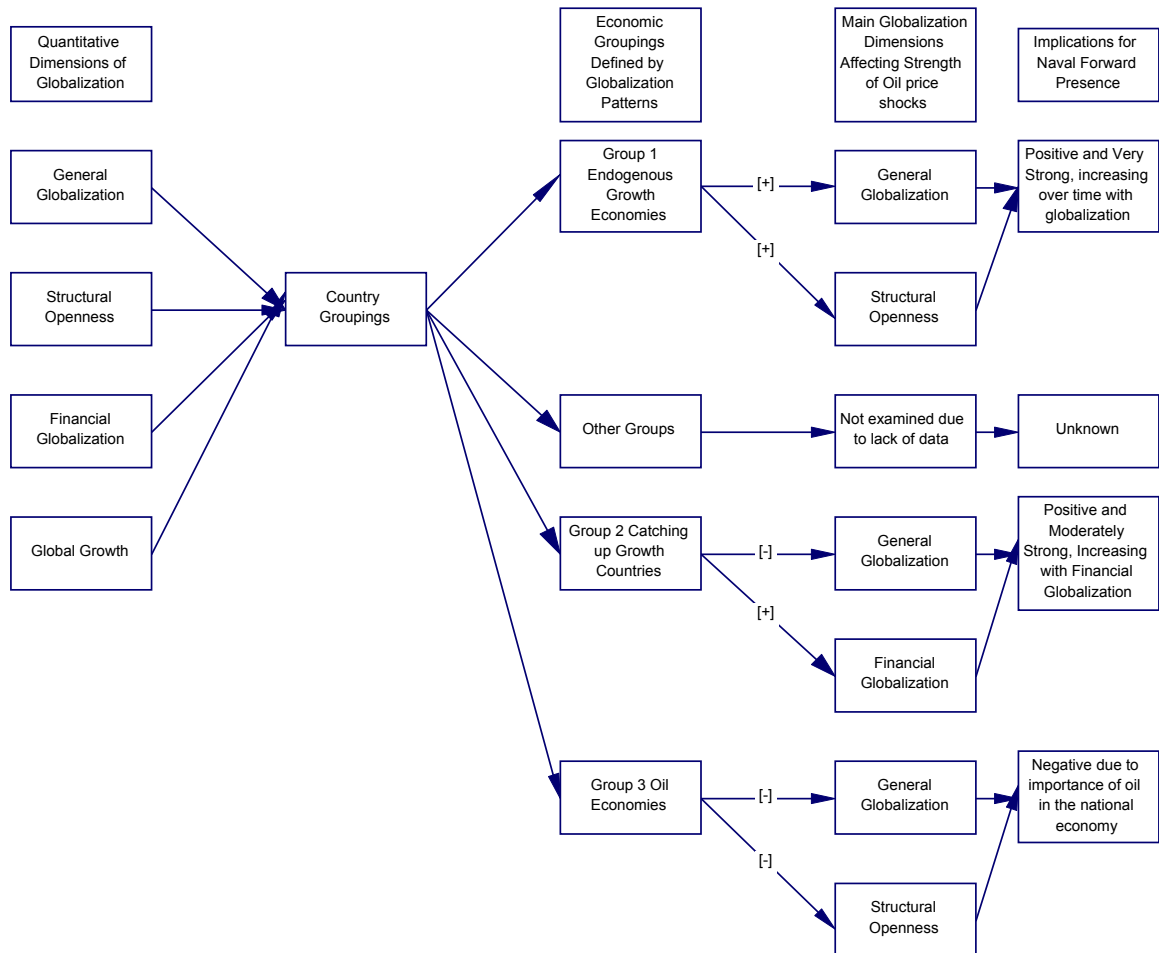
	Globalization Dimension Impact				Oil Shock Strength Over Time	Naval Forward Presence
	General	Structural	Financial	Global		
	Globalization	Openness	Globalization	Growth		
<u>Group 1 Countries</u>						
United States	+				+	++
Australia	+	+	+		(-)	++
Austria	+	+	(-)		+	++
Canada	+			+	+	++
Finland	+	+	+	(-)	+	++
France	+				+	++
Germany	+	+		+	+	++
Italy	+				+	++
Netherlands	+	+	?	+	+	++
Sweden	+	+	(-)	(-)	+	++
United Kingdom	+				+	++
Japan	+		(-)		+	+
Spain	+	+	(-)	(-)	=	+
<u>Group 2 Countries</u>						
Korea	(-)	+	+	(-)	=	+
Philippines	(-)	(-)	+		+	+
Portugal	(-)			(-)	+	+
South Africa	(-)		+	+	+	+
<u>Oil Countries</u>						
Mexico (Group 2)	(-)	(-)			=	(-)
Norway (Group 1)	(-)	(-)	+	(-)	(-)	(-)

### **Summary and Implications**

Summing up for the future (Figure 7), these findings combined with likely trends in globalization, suggest that the Navy's forward presence is more than likely to produce economic benefits to the United States' economy and those of the other major industrial economies in the years to come. Increased integration of markets should aid in transmitting the Navy's stabilizing effect on markets.

Figure 7

Summary: Globalization and the Economic Strength of Naval Forward Presence



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